(12) UK Patent Application (19) GB (11) 2 085 635 A

(21) Application No 8124894
(22) Date of filing 14 Aug 1981
(30) Priority data
(31) 55/114489U
(32) 14 Aug 1980
(33) Japan (JP)
(43) Application published 28 Apr 1982
(51) INT CL³ G11B 3/60 17/04 23/02
(52) Domestic classification G5R B261 B361 B36Y B421 B482 B511 B513 B687 B68X B789 B885 FA PP
(56) Documents cited GB 2013957
(58) Field of search G5R
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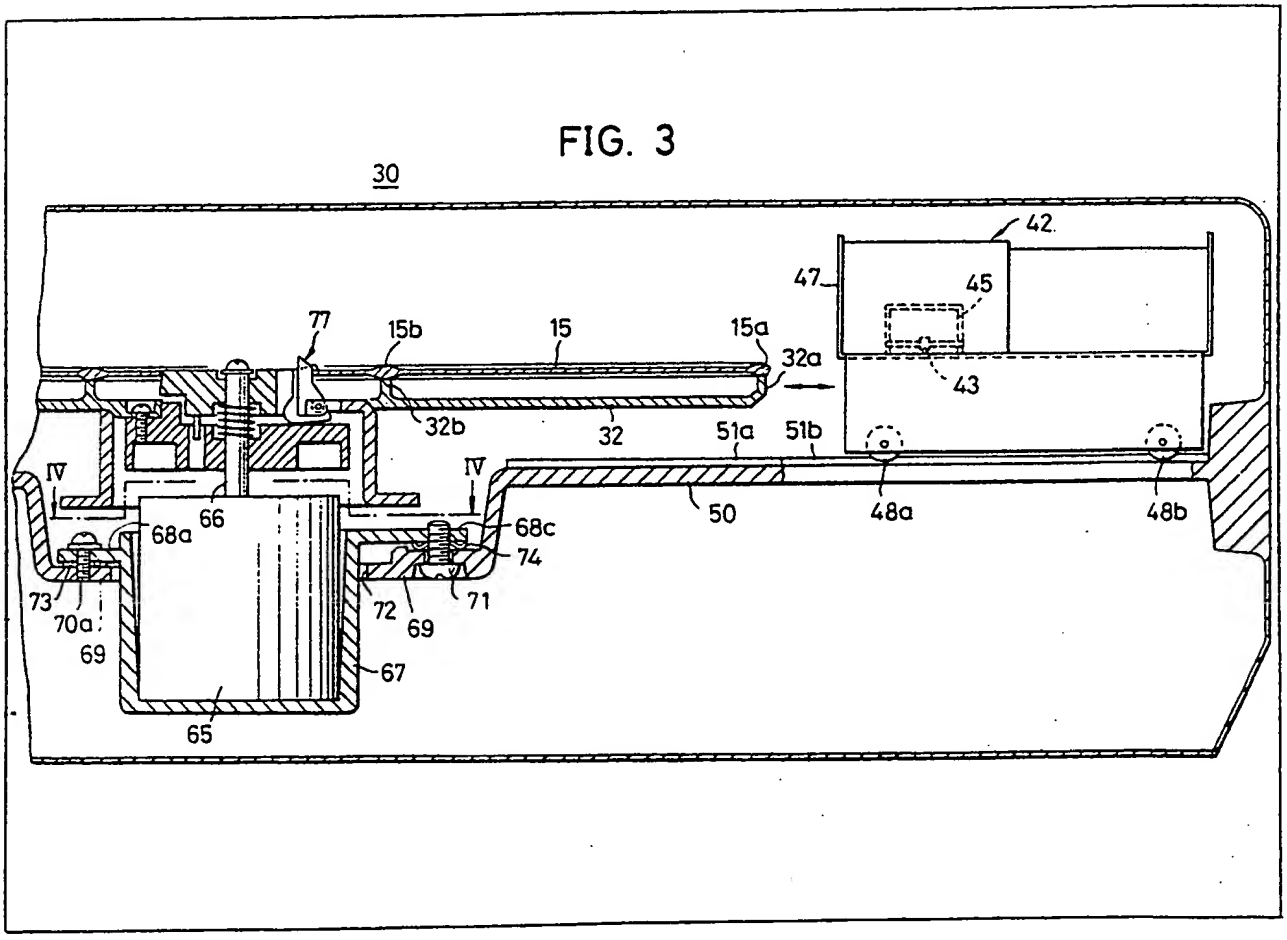
(54) Disc record reproducing apparatus with turntable adjusting mechanism

(57) The apparatus 30 includes means for adjusting the turntable position such that the part beneath the seaming path of the transducer is made parallel to the transducer path. The adjusting mechanism comprises a mounting part 69 provided on the chassis, a support part 67 to be mounted onto the mounting part, for supporting the turntable driving motor, one or a plurality of fixing screws 70*a*, 70*b* for mounting and fixing the support part to the mounting part at at least one position, and one or a plurality of adjusting screws 71 for mounting the support part at another position and adjusting the distance between the support part and the mounting part. The adjusting screws perform a distance adjustment for adjusting the inclination of the motor and the turntable.

FIG. 3



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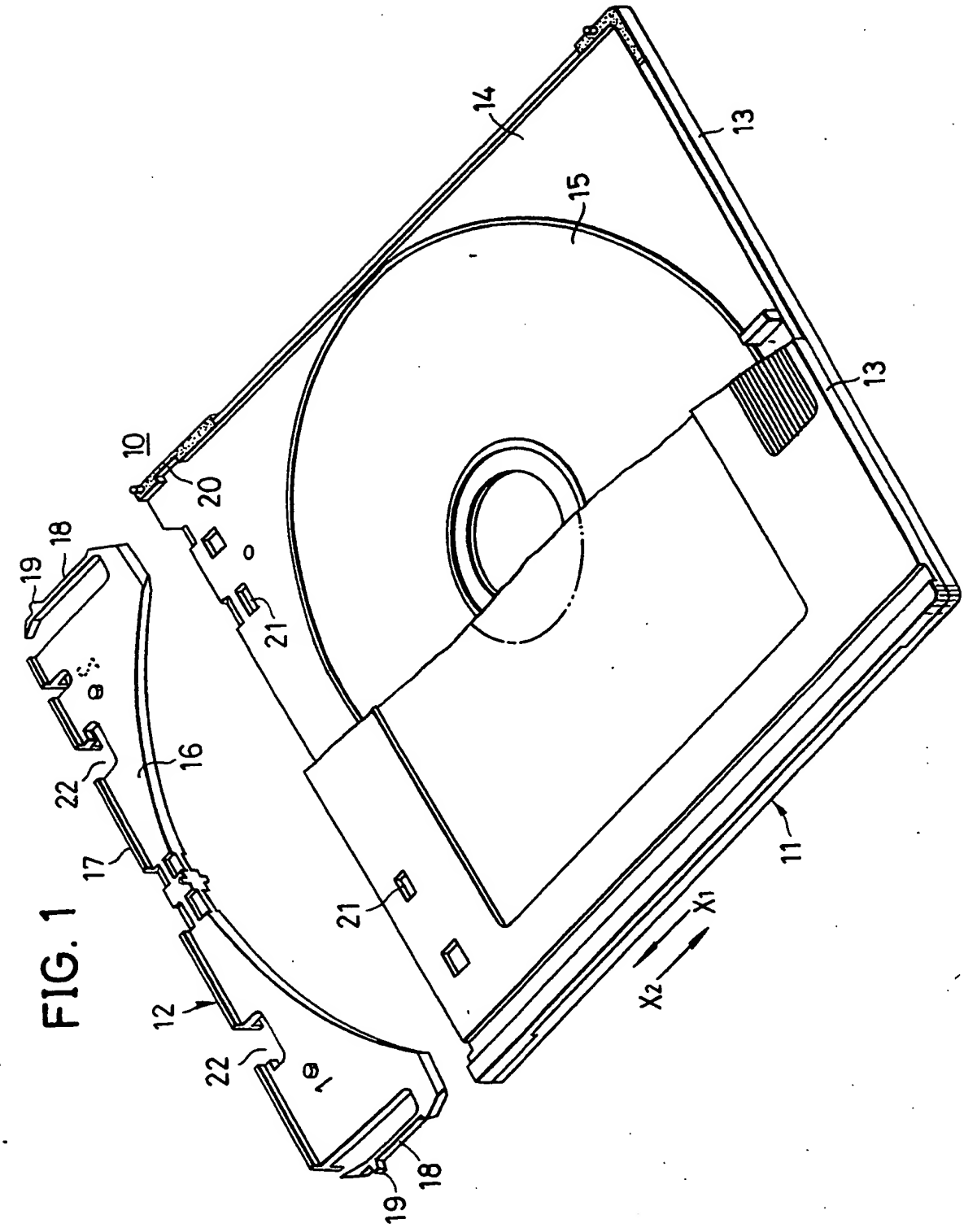

FIG. 1

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FIG. 2

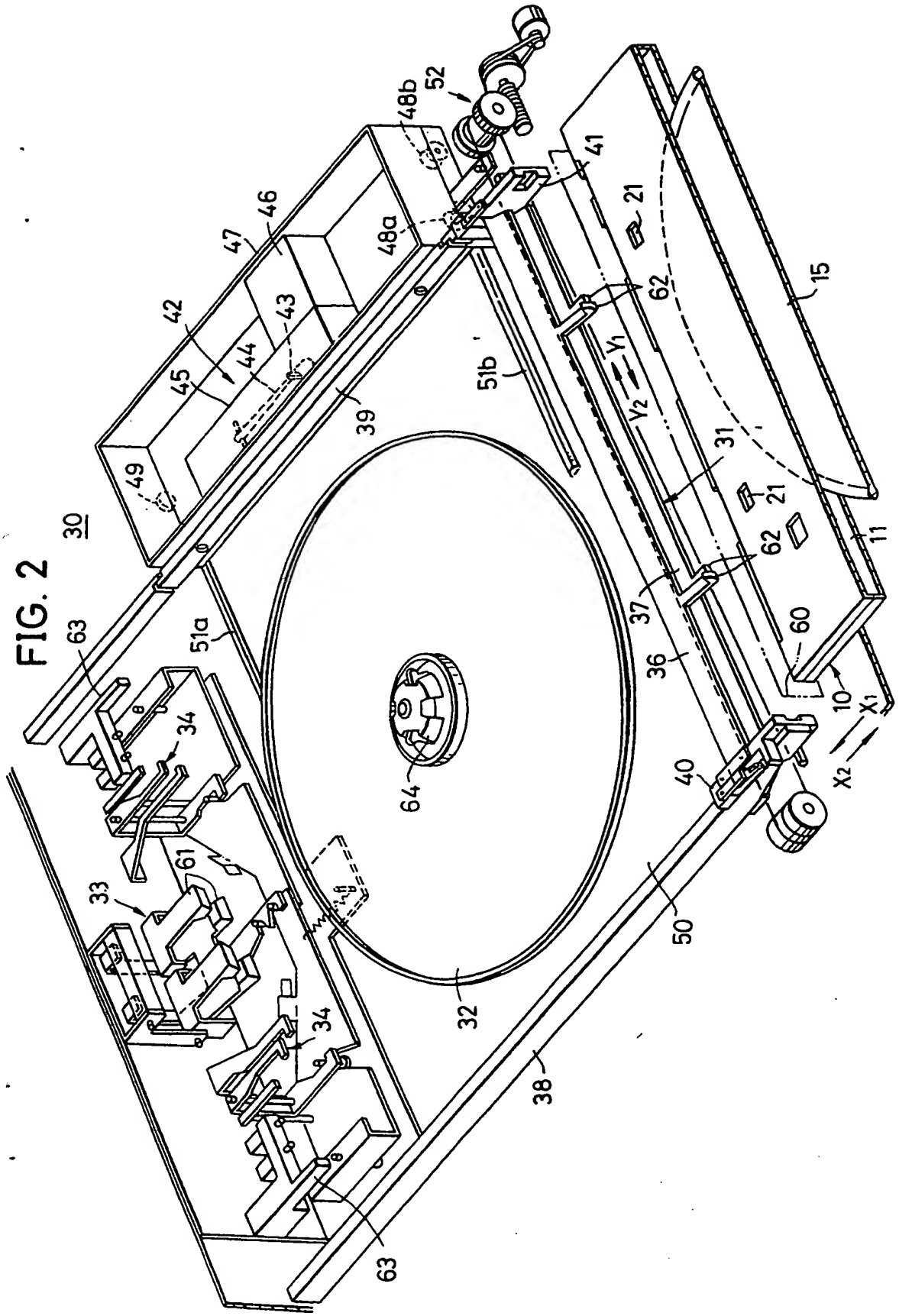

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FIG. 3

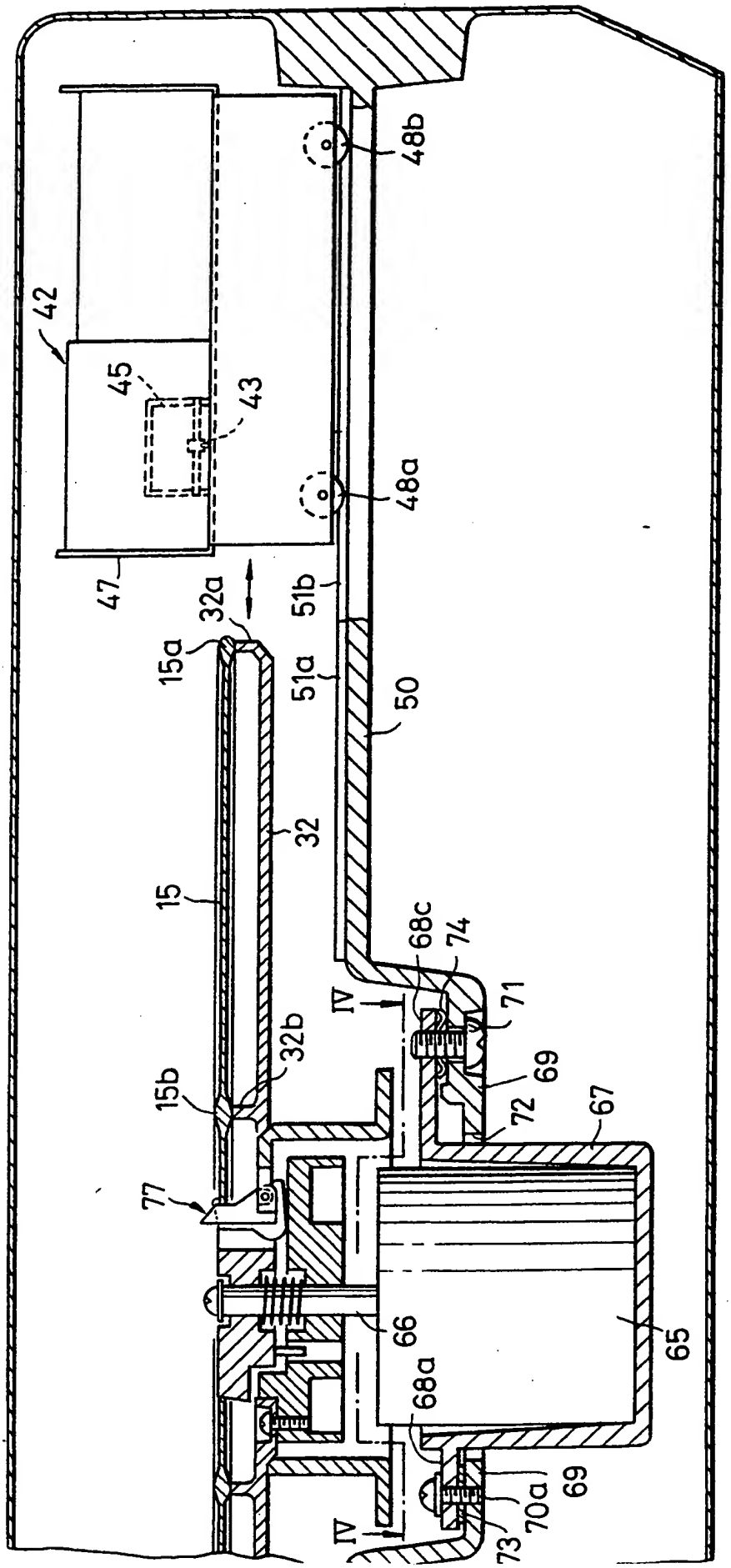

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FIG. 4

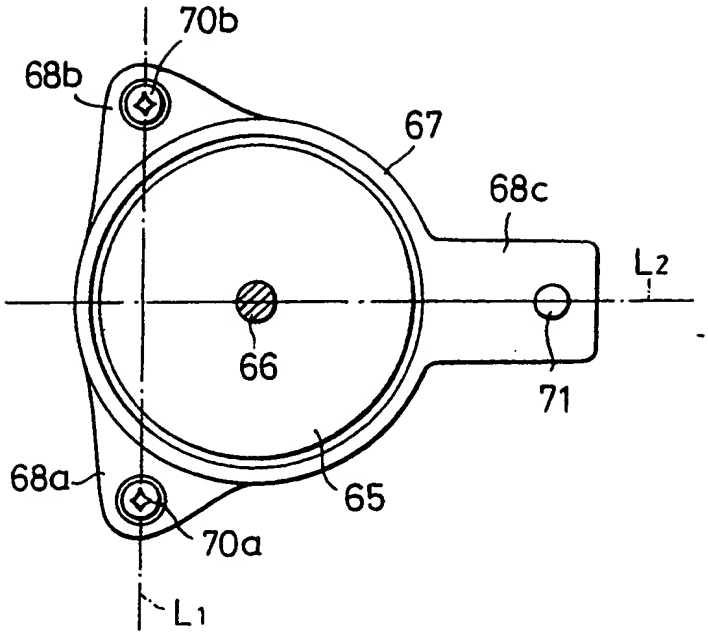


FIG. 5

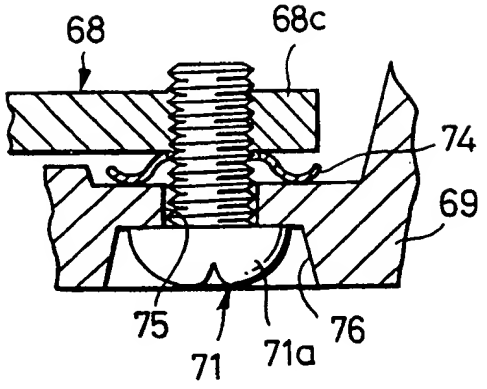
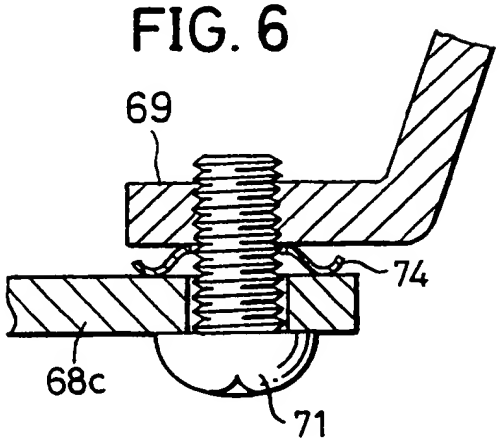


FIG. 6



SPECIFICATION

Rotary recording medium reproducing apparatus having a parallel degree adjusting mechanism for a turntable

The present invention generally relates to rotary recording medium reproducing apparatuses, and more particularly to a rotary recording medium reproducing apparatus having a mechanism capable of adjusting the carrying rotary surface of a turntable which carries a rotary recording medium, so that the carrying rotary surface of the turntable is parallel with respect to a transferring path of a reproducing transducer.

Reproducing apparatuses have been reduced to practical use in which a rotary recording medium (hereinafter simply referred to as a disc) in which an information signal such as a video signal and an audio signal is recorded as variations in geometrical configuration is placed and carried onto a turntable, and a reproducing transducer having a reproducing stylus is transferred along a radial direction of the disc, to reproduce the recorded signal according to variations in electrostatic capacitance between the reproducing stylus and the disc.

In the above type of a reproducing apparatus, the reproducing stylus must always make contact with the recorded surface of the disc with a predetermined stylus pressure throughout the entire reproducing range from the outermost periphery to the innermost periphery of the disc, in order to constantly perform reproduction in a stable state. In order to always obtain the above predetermined stylus pressure, the distance between the reproducing transducer provided with the reproducing stylus and the disc placed on the turntable must be constant throughout the entire transferring range of the reproducing transducer on the disc. Accordingly, the transferring path of the reproducing transducer must at least be parallel with respect to a part of the disc placed on the turntable which opposes the above transferring path, in the entire transferring range of the reproducing transducer.

However, the turntable is generally fixed so as to unitarily rotate with a rotary shaft of a rotationally driving motor for the turntable, and the driving motor is mounted onto a chassis. Therefore, in a case where inconsistency exist at the mounting part of the chassis where the driving motor is mounted, or inconsistency exist in mounting of the driving motor to the mounting part of the chassis, the driving motor is mounted in an inclined manner as a result. In this case, the turntable is inclined and not parallel with respect to the transferring path of the reproducing transducer, and further, the disc placed onto the turntable accordingly is inclined and not parallel with respect to the above transferring path.

Moreover, when errors are introduced upon mounting of guide rails which guide the reproducing transducer when the reproducing transducer is transferred, the reproducing transducer is not transferred in a parallel manner. Hence, the above turntable and the transferring path of the reproducing transducer do not become parallel with respect to each other.

Accordingly, upon assembling of the reproducing apparatus, the mounting positions of the guide rails for guiding the reproducing transducer were conventionally adjusted, so that the transferring path of the reproducing transducer becomes parallel with respect to the turntable. However, the adjusting operation was troublesome in the conventional adjusting method. The adjusting operation required skill, and there was a disadvantage in that too much time was required to perform the adjusting operation.

Accordingly, it is a general object of the present invention to provide a novel and useful rotary recording medium reproducing apparatus having a parallel degree adjusting mechanism for a turntable, in which the above described conventional disadvantages have been overcome.

The present invention provides a rotary recording medium reproducing apparatus comprising a turntable which carries a rotary recording medium, a driving motor for rotating said turntable, a chassis to mount said driving motor, a reproducing transducer having a reproducing element which is transferred along a radial direction of said rotary recording medium carried on said turntable to perform reproduction, and a parallel degree adjusting mechanism, said adjusting mechanism comprising, a mounting part provided on said chassis, a support part to be mounted onto said mounting part, for supporting said driving motor, fixing screw means for mounting and fixing said support part to said mounting part at at least one position, and adjusting means for mounting said support part at another position and adjusting the distance between the support part and said mounting part, said adjusting means performing a distance adjustment for adjusting the inclination of said motor and said turntable, so that at least a part of said turntable corresponding to a transferring path of the reproducing element of said reproducing transducer is adjusted to become parallel with said transferring path.

Another and more specific object of the present invention is to provide a rotary recording medium reproducing apparatus having a parallel degree adjusting mechanism for a turntable capable of performing adjustment so that a part of a turntable opposing a transferring path of a reproducing transducer becomes parallel with respect to the transferring path of the reproducing transducer, by adjusting the mounting state of a motor to a chassis, where the turntable is fixed to a rotary shaft of the motor.

Still another object of the present invention is to provide a rotary recording medium reproducing apparatus having a mechanism consisting of a fixing screw for mounting a motor to a chassis, where a turntable is fixed to a rotary shaft of the motor, and an adjusting screw provided with a resilient spring washer member between the chassis and the adjusting screw, for adjusting the

parallel degree of the turntable with respect to the transferring path of the reproducing transducer, by adjusting the above two screws to adjust the mounting state of the motor to the chassis.

According to the apparatus of the present invention, the parallel degree of the turntable can be adjusted with ease, by variably adjusting the amount which the above adjusting screw is screwed in.

Other objects and further features of the present invention will be apparent from the following detailed description when read in conjunction with the accompanying drawings.

FIG. 1 is a perspective view, with a part cut away, showing an example of a disc case which operates together with a rotary recording medium reproducing apparatus;

FIG. 2 is a diagram showing an embodiment of a rotary recording medium reproducing apparatus having a parallel degree adjusting mechanism for a turntable according to the present invention, with an outer frame disassembled;

FIG. 3 is a front view showing the reproducing apparatus shown in FIG. 2 in a vertical cross-section.

FIG. 4 is a plan view showing an adjusting mechanism part which forms an essential part of the reproducing apparatus according to the present invention;

FIG. 5 is an enlarged view showing an adjusting screw in a vertical cross-section; and

FIG. 6 is a diagram showing a modification of an adjusting screw mechanism part in a vertical cross-section.

In FIG. 1, a disc case 10 comprises a jacket 11 and a lid plate 12. The jacket 11 is assembled from a pair of jacket halves 13 and 13, and comprises a flat cavity or space 14 therein. This space 14 accommodates a disc 15. The lid plate 12 comprises a plate-shaped main lid body 16, and a rim portion 17 formed unitarily at the front edge of the main lid body 16. A pair of engaging arms 18 are formed on both sides of the main lid body 16. The main lid body 16 of the lid plate 12 is inserted into a predetermined position within the jacket 11. Moreover, projections 19 of the engaging arms 18 engage into depressions 20, and thus, the lid plate 12 engages with the jacket 11.

As shown in FIG. 2, a reproducing apparatus 30 substantially comprises a jacket opening enlarging mechanism 31, a turntable 32 to rotate the disc 15 positioned thereon, a disc holding mechanism 33 for clamping the disc 15, a lid plate locking mechanism 34 for locking the lid plate 12, and the like.

The jacket opening enlarging mechanism 31 comprises upper and lower beams 36 and 37 extending in the directions of the arrows Y1 and Y2, and the supporting members 40 and 41 (sliders) which are respectively fixedly inserted into the guide rails 38 and 39, to support both ends of the respective beams 36 and 37.

A reproducing transducer 42 comprises a pickup device 45 including a cantilever 44 provided with a reproducing stylus 43, a resonator 46 and the like, and is mounted to a carriage 47. The carriage 47 has flange parts provided unitarily at both sides thereof, and the flanges are provided with grooved rollers 48a and 48b, and a roller 49. The roller 49 rolls over a rail 51a provided on a chassis 50 of the reproducing apparatus, and the rollers 48a and 48b respectively roll over a rail 51b. Accordingly, the carriage 47 moves in the directions of arrows Y1 and Y2. The rails 51a and 51b are formed unitarily on the chassis 50 by being bent in a manner such that the cross-sectional shape of the rail is of a corrugated shape.

The disc holding mechanism 33 is provided at the inner part of the reproducing apparatus 30 on the opposite side of an inserting opening 60, and comprises a pair of upper and lower holding fingers 61.

Upon reproduction of the disc 15, the disc case 10 is inserted through the inserting opening 60 of the reproducing apparatus 30, by inserting the disc case 10 with the side of the lid plate 12 into the direction of the arrow X1. when the jacket opening enlarging mechanism 31 is pushed and moved in the direction of the arrow X1 by the disc case 10, the enlarging mechanism 31 moves, the upper and lower beams 36 and 37 rotate, and enlarging fingers 62 thus respectively move in directions to mutually separate from each other. Accordingly, the tip ends of the enlarging fingers 62 engage with engaging windows 21 of the jacket 11, and enlarge the front part of the upper and lower jacket halves 13 upwards and downwards, to enlarge the opening.

When the disc case 10 is inserted into the innermost part of the reproducing apparatus 30 together with the enlarging mechanism 31 through the upper side of the turntable 32, cutouts 22 of the lid plate 12 is locked by the lid plate locking mechanism 34. Hence, the lid plate 12 is locked and held at the innermost part of the reproducing apparatus 30.

Furthermore, engagement releasing members 63 enter inside the openings on the right and left sides of the disc case 10, and push the sloping surfaces at the tip ends of the engaging arms 18. Accordingly, the engaging arms 18 are respectively distorted inwards, and the projections 19 respectively slip out from the depressions 20, to release the engagement of the lid plate 12 with respect to the jacket 11. Further, the disc 15 is held at a predetermined height by the holding fingers 61.

Next, the jacket 11 is pulled out in the direction of the arrow X2. Since the lid plate 12 and the disc 15 are respectively locked and clamped as described above, only the jacket 11 is moved in the direction of the arrow X2, leaving behind the lid plate 12 and the disc 15. Accompanied by this pulling out of the jacket 11, the lid plate 12 and the disc 15 are relatively pulled out from within the jacket 11. The disc 15 is supported horizontally directly above the turntable 32 by the holding fingers 61 and a disc clamping

mechanism 64 which is in a raised position, in a state where the jacket 11 is completely pulled out from the reproducing apparatus 30.

When a start button (not shown) is pushed, the disc holding mechanism 33 releases the holding operation, and the disc clamping mechanism 64 is lowered. The disc 15 is lowered onto the turntable 32 which is parallel with the chassis 50, and rotated towards the clockwise direction. Further, the reproducing transducer 42 moves in the direction of the arrow Y1 together with the carriage 47, from a waiting position.

When the reproducing stylus 43 reaches the lead-in position of the disc 15, a current is supplied to a coil (not shown) for lowering the stylus. Accordingly, the reproducing stylus 43 is lowered, to make contact with the recording surface of the disc 15 which is placed onto the turntable 32, in a normal position with a predetermined stylus pressure. Therefore, the rotating disc 15 is relatively scanned by the reproducing stylus 43 and the recorded signal is reproduced from the recording surface of the disc 15.

As the reproducing transducer 42 is transferred towards the direction of the arrow Y1, the reproducing stylus 43 is transferred along the radial direction of the disc 15. In order for the reproducing stylus 43 to make contact with the recording surface of the disc 15 with a predetermined stylus pressure uniformly throughout the entire transferring interval of the reproducing stylus 43 from the outermost periphery to the innermost periphery of the disc 15, the distance between the reproducing transducer 42 and the turntable 32 (or the disc 15 on the turntable 32) must always be constant throughout the above entire transferring interval. That is, the transferring path of the reproducing stylus 43 of the reproducing transducer 42 and at least the part of the turntable (or the disc 15) corresponding to the transferring path of the reproducing stylus 43 must be parallel with each other.

The turntable 32 is provided with rim portions 32a and 32b formed at the outermost and innermost peripheral edges thereof. Groove guards 15a and 15b respectively formed at the outermost and innermost peripheral part of the disc 15, which are of larger thicknesses than that of the recording surface part of the disc 15, are respectively placed onto the above rim portions 32a and 32b. When closely observing the dimensions of the above rim portions 32a and 32b, the rim portion 32b is formed 0.2 mili-meters lower than the rim portion 32a, for example. Accordingly, in a state where the disc 15 is placed onto the turntable 32, only the groove guard 15a makes contact with the rim portion 32a. However, when the center part of the disc 15 is locked by a locking mechanism 77, the innermost peripheral side of the disc 15 is pushed downwards, and the groove guard 15b also makes contact with the rim portion 32b. Therefore, in the present specification, the description that the reproducing transducer and the turntable or the disc is parallel, means that the transferring path of the reproducing transducer 42 is parallel with the surface of the turntable 32 onto which the disc 15 is placed (in the present embodiment of the invention, the surface of the turntable 32 includes the rim portions 32a and 32b), or the recording surface of the disc 15 placed onto the turntable 32 which is in a state where the center part of the disc 15 is locked (that is, in a state ready for reproduction).

A mechanism for adjusting the parallel degree of the above turntable 32 will now be described in conjunction with FIGS. 3 through 5. In FIG. 3, those parts which are the same as those corresponding parts in FIG. 2 are designated by like reference numerals, and their description will be omitted.

The turntable 32 is fixed to the upper part of a rotary shaft 66 of a driving motor 65. The motor 65 is fixed and accommodated within a casing 67 having flanges 68a through 68c at the upper part thereof, as parts which are to be mounted. The casing 67 is mounted to a mounting part 69 which is unitarily formed with the flanges 68a through 68c on the chassis 50, by fixing screws 70a and 70b and an adjusting screw 71. The mounting part 69 is of a U-shape so that the mounting part 69 is lower than the surface of the main body part of the chassis 50 formed with the rails 51a and 51b. Further, a hole 72 is formed at the center of the mounting part 69.

The casing 67 is inserted into the hole 72 from above the chassis 50, and the flanges 68a through 68c are respectively placed onto the mounting part 69. In the present embodiment of the invention, the flanges 68a and 68b are fixed by the fixing screws 70a and 70b in a state where washers 73 are provided between the flanges 68a and 68b and the mounting part 69.

As shown in FIG. 5, a plate spring or a spring washer 74 is provided between the flange 68c and the mounting part 69. The adjusting screw 71 is inserted through a hole 75 provided in the mounting part 69 from the lower surface of the mounting part 69, and is screwed and fixed to the flange 68c. Accordingly, the spring washer 74 is compressed according to the amount which the adjusting screw 71 is screwed in. The above spring washer 74 urges the flange 68c and the mounting part 69 so as to mutually separate from each other, due to a resilient force stored due to the compression of the spring washer 74. Therefore, a screw head 71a of the adjusting screw 71 makes contact and presses against the lower surface of the U-shaped part of the mounting part 69.

The adjusting screw 71 lies on a line L2 which bisects and is perpendicular to a line L1 connecting the fixing screws 70a and 70b in the plan view as shown in FIG. 4. This line L2 coincides with the transferring direction of the reproducing stylus 43 which is transferred together with the reproducing transducer 42.

When the adjusting screw 71 is rotated to be

screwed in by use of a screw driver and the like, the screw 71 becomes relatively screwed in with respect to the flange 68c. However, since the screw head 71a of the screw 71 makes contact with the lower surface of a depression 76 of the mounting part 69, the flange 68c moves down by compressing and deforming the spring washer 74. Hence, the casing 67 rotates in the clockwise direction in FIG. 3 by a minute quantity with the part which is fixed by the fixing screws 70a and 70b as the fulcrum. Further, accompanied by the minute rotational displacement of the casing 67, the turntable 32 also is displaced in the same direction as the casing 67.

On the other hand, when the adjusting screw 71 is rotated in a direction so as to unscrew the screw 71, the flange 68c is displaced towards a direction so as to separate from the mounting part 69 due to the resilient force exerted by the spring washer 74. Therefore, the casing 67 rotates in the counter clockwise direction in FIG. 3 by a minute quantity with the part which is fixed by the fixing screws 70a and 70b as the fulcrum. Moreover, accompanied by the minute rotational displacement of the casing 67, the turntable 32 also is displaced in the same direction as the casing 67.

Accordingly, by rotationally adjusting the adjusting screw 71, the inclination of the turntable 32 can be adjusted with ease, so that the turntable 32 (or the disc 15) becomes parallel with respect to the transferring path of the reproducing transducer 42 (or the reproducing stylus 43).

In the present embodiment of the invention, the line L2 which passes the above adjusting screw 71 coincides with the transferring path of the reproducing stylus 43 in the plan view. Hence, the transferring path of the reproducing transducer 42 (the transferring path in a state where the reproducing stylus 43 is not lowered) can be adjusted with ease so as to become parallel with an intended transferring path along which the reproducing stylus 43 must be transferred while scanning over the disc 15, by adjusting a single adjusting screw 71.

In a case where it is desirable to adjust the inclination of the turntable 32 in a direction other than the direction along the above line L2, one of or both the fixing screws 70a and 70b can be constructed as adjusting screws in addition to the adjusting screw 71. Furthermore, the number of screws used, is not limited to the number of screws used in the above embodiment of the invention. However, the above described embodiment of the invention is a desirable embodiment in that effective adjustment can be made on the parallel degree of the turntable 32 by use of a simple construction.

When the above adjusting operation is performed, a dial guage (not shown) is mounted to the carriage 47. Thus, the adjusting operation is performed by rotationally adjusting the adjusting screw 71 so that the height of the outermost peripheral rim portion 32a of the turntable 32 and the height of the innermost peripheral rim portion 32b become equal, by measuring the two heights.

In addition, the hole of the flange 68c can be constructed so that a screw hole is provided at an opposing position from the hole of the flange 68c in the mounting part 69, and the screw head 71a of the adjusting screw 71 makes contact with the lower surface of the flange 68c. In this case, the adjusting screw 71 is screwed into the mounting part 69 in a state where the spring washer 74 is provided between the mounting part 69 and the flange 68c. Accordingly, the flange 68c is mounted to the lower surface of the mounting part.

Moreover, in the above embodiment of the invention, the motor 65 is accommodated within the casing 67 having the flanges 68a, 68b, and 68c. However, instead of using the casing 67, the flanges 68a through 68c can be unitarily provided directly onto the outer frame of the motor 65.

Further, this invention is not limited to these embodiments but various variations and modifications may be made without departing from the scope of the invention.

CLAIMS

1. A rotary recording medium reproducing apparatus comprising a turntable which carries a rotary recording medium, a driving motor for rotating said turntable, a chassis to mount said driving motor, a reproducing transducer having a reproducing element which is transferred along a radial direction of said rotary recording medium carried on said turntable to perform reproduction, and a parallel degree adjusting mechanism, said adjusting mechanism comprising:

a mounting part provided on said chassis;

a support part to be mounted onto said mounting part, for supporting said driving motor;

fixing screw means for mounting and fixing said support part to said mounting part at at least one position; and

adjusting means for mounting said support part at another position and adjusting the distance between the support part and said mounting part,

said adjusting means performing a distance adjustment for adjusting the inclination of said motor and said turntable, so that at least a part of said turntable corresponding to a transferring path of the reproducing element of said reproducing transducer is adjusted to become parallel with said transferring path.

2. A rotary recording medium reproducing apparatus as claimed in claim 1 in which said fixing screw means consists of two fixing screws for mounting said support part to said mounting part at two mutually separated positions, and said adjusting means consists of an adjusting screw provided at a position on a line which bisects and is perpendicular to a line connecting said two fixing screws in a plan view.

3. A rotary recording medium reproducing apparatus as claimed in claim 2 in which said fixing screw means and said adjusting means are arranged and provided in a manner such that said bisecting and perpendicular line coincides with the direction of the transferring path of the reproducing element of said reproducing transducer in a plan view.

4. A rotary recording medium reproducing apparatus as claimed in claim 1 in which said adjusting means has a spring member provided between said support part and said mounting part, and an adjusting screw which is screwed into one of said support part and said mounting part and whose screw head makes contact and is engaged by the other of said support part and said mounting part.

5. A rotary recording medium reproducing apparatus as claimed in claim 1 in which said adjusting means has a spring member provided between said support part and said mounting part, a hole provided in said mounting part, a screw hole provided in said support part, and an adjusting screw whose screw head makes contact with the lower surface of said mounting part and whose screw portion is screwed into the screw hole of said support part through the hole of said mounting part.

6. A rotary recording medium reproducing apparatus as claimed in claim 1 in which said adjusting means has a spring member provided between said support part and said mounting part, a hole provided in said support part, a screw hole provided in said mounting part, and an adjusting screw whose screw head makes contact with the lower surface of said support part and whose screw portion is screwed into the screw hole of said mounting part through the hole of said support part.

7. A rotary recording medium reproducing apparatus as claimed in claim 1 in which said reproducing transducer is transferred while being guided along rails provided unitarily with said chassis.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1982. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.